QUALITY ASSURANCE ADDENDUM

QAA 6.1

to the

ROCKY FLATS SITE-WIDE QA PROJECT PLAN

FOR CERCLA RI/FS AND RCRA RFI/CMS ACTIVITIES

for

OPERABLE UNIT NO. 6, WALNUT CREEK PRIORITY DRAINAGE

PHASE I RFI/RI

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

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Quality Assurance Addendum to the Rocky Flats Site-Wide QA Project Plan for CERCLA RI/FS and RCRA RFI/CMS Activities for Operable Unit No. 6, Walnut Creek Priority Drainage Phase I RFI/RI

Approved By:

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INTRODUCTION AND SCOPE

This QA Addendum (QAA) supplements the "Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA RI/FS and RCRA RFI/CMS Activities." The QAA establishes the specific QA controls applicable to the field investigation activities described in the Phase I RCRA Remedial Investigations/Remedial Investigations (RFI/RI) Work Plan for the Walnut Creek Drainage (Operable Unit No. 6) dated **February 1991** (OU-6 Workplan).

1.0 ORGANIZATION AND RESPONSIBILITIES

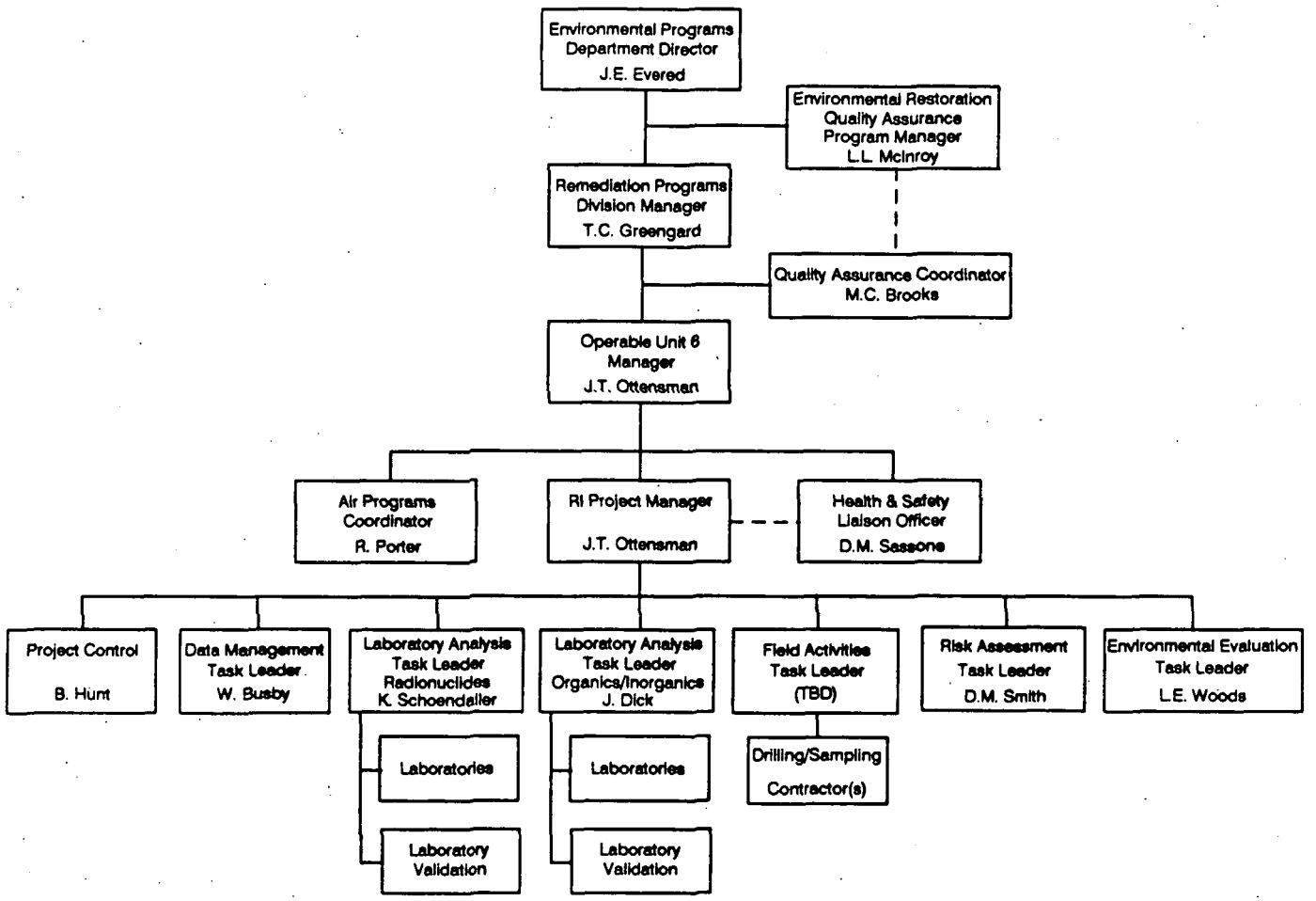
The overall organization of EG&G Rocky Flats and the Environmental Restoration (ER) divisions involved in environmental restoration activities is shown in Figures 1-1, 1-2, and 1-3 of the QA Project Plan (QAPjP). Individual responsibilities are also described in detail in Section 1.3 of the Quality Assurance Project Plan (QAPjP).

Contractors will be tasked by EG&G Rocky Flats to implement the field activities outlined in the OU-6 Workplan. The specific ER Department personnel who will interface with the Contractors and who will provide technical direction are shown in Figure 1.

2.0 QUALITY ASSURANCE PROGRAM

The QAPjP was written to address QA controls and requirements for implementing Interagency Agreement (IAG) related activities. As such, the controls and requirements addressed in the QAPjP are applicable to OU-6 Phase I activities, unless specified otherwise in this QAA. As a supplement to the QAPjP, this QAA addresses additional and site-specific QA controls and requirements that are applicable to OU-6 Phase I activities.

FIGURE 1. PROJECT MANAGEMENT FOR OPERABLE UNIT 6, WALNUT CREEK DRAINAGE, PHASE I RFI/RI



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2.1 Training

All ER Department and contractor personnel performing field activities at OU-6 shall complete the minimum training requirements specified in Section 2.4 of the QAPjP. In addition, all personnel performing activities in accordance with the Standard Operating Procedures (SOPs) specified in this QAA shall receive documented training on the QAPjP, QAA and training specified in the applicable SOPs prior to performing the work. Such personnel include, but are not limited to, those performing or supervising the following activities:

- Drilling/boring;
- Installation/completion of groundwater monitoring wells;
- Sample collection (all media);
- Sample chain-of-custody/preservation/handling;
- Equipment decontamination;
- Field measurements (e.g., pH, conductivity, temperature, dissolved oxygen, flow rate);
- Water level measurements;
- Data validation; and
- Environmental surveying and sample collection.

3.0 DESIGN CONTROL AND CONTROL OF SCIENTIFIC INVESTIGATIONS

The OU-6 Workplan is the investigation design control plan for the Phase I RFI/RI activities to be conducted in the Walnut Creek Priority Drainage Area. The sampling rationale and investigation program, including sample locations, frequency, and analytical requirements, are presented in the OU-6 Work Plan and are summarized in this QAA. Specific SOPs to be implemented by EG&G Rocky Flats and Contractor personnel during all aspects of the field investigation are also identified here.

3.1 Data Quality Objectives

3.1.1 Objectives

The Field Sampling Plan (Section 7.0) of the OU-6 Workplan is designed to obtain data necessary to characterize the physical and hydrologic setting of the Individual Hazardous Substance Sites (IHSSs) within the Walnut Creek Priority Drainage area, assess the presence or absence of contamination, characterize the nature and extent of contamination at the sites, and support the Phase I Baseline Risk Assessment and Environmental Evaluation. A stepped approach as outlined in the IAG will be used in Phase I to accomplish these objectives. The following activities will be performed as part of the Phase I Field Sampling Plan:

- Review existing data, including aerial photographs and site records;
- Conduct field screenings, including radiation, geophysical, soil, and gas surveys;
- Collect surface water, surface soil, and sediment samples;
- Drill to collect soil samples at depth and characterize subsurface soil, geologic, and hydrogeologic conditions; and
- Install and sample groundwater monitoring wells.

Site-specific Phase I RFI/RI objectives/data needs and corresponding methods of sampling/analysis are outlined in Table 4-1 of the OU-6 Workplan.

In addition to the Field Sampling Plan activities described in Section 7.2 of the OU-6 Workplan, environmental evaluation (EE) field activities will be conducted as described in the Environmental Evaluation Workplan for OU-6 (Section 9.0 of the OU-6 Workplan). These EE activities include:

- Performing aquatic and terrestrial field surveys,
- Collecting and analyzing terrestrial and aquatic biota samples, and
- Performing toxicity tests to measure the effects of contaminated environmental media on representative species.

Table 4-1 of the OU-6 Workplan lists the analytical levels that are appropriate to the RFI/RI objectives/data needs and data uses. (These analytical levels are discussed and described in Appendix A of the QAPjP.) The analytical levels for the Phase I investigations at OU-6 include levels I-V. Precision, accuracy, and completeness parameters are not applicable to analytical level I (field screening). Data quality objectives (DQOs) for this level are met by adhering to specific field instrument calibration instructions and field surveying/logging SOPs.

The analytical program requirements for the OU-6 Phase I investigations are discussed in Section 7.3.2 of the OU-6 Workplan. The specific analytes for the various media at each of the OU-6 IHSSs are contained in Table 7-9 of the OU-6 Workplan. The analytical program specifies the use of analytical methods referenced in the EG&G Rocky Flats General Radiochemistry and Routine Analytical Services Protocol (GRRASP) for all analytes. These analytical methods are appropriate for meeting the data quality requirements for analytical levels II-V. The precision, accuracy, and completeness parameters for analytical levels II-V are discussed below, along with comparability and representativeness for all levels. The following DQOs for precision, accuracy, and completeness will be used by the EG&G Environmental Assessment and Monitoring Division (EMAD) or its contractors to evaluate the quality of laboratory and field data.

3.1.2 Precision and Accuracy

CLP Analyses: The DQOs for precision and accuracy for the analytical methods referenced in the GRRASP, which includes EPA CLP protocols and standard EPA methods when CLP protocols are unavailable, are included in Appendix B of the QAPjP. Since the analytical program for OU-6 will utilize the analytical methods referenced in the GRRASP, these objectives are applicable to the OU-6 Phase I RFI/RI. These objectives are reproduced here in Appendix A.

All of the parameters listed in the OU-6 Workplan (Table 7-9) for the Phase I analytical program are addressed in the Analytical Methods Detection Limits, and DQO Table in Appendix A.

3.1.3. Completeness

The target completeness objective for both field and analytical data for this project is 90 percent.

3.1.4 Comparability

Comparability is a qualitative parameter that shall be ensured by implementation of an approved sampling and analysis plan, standardized analytical protocols, and SOPs for field investigations (discussed in Section 11 of the OU-6 Workplan and listed here in Table 1), and by reporting data in uniform units as specified in the OU-6 Workplan and SOPs listed in Table 1.

3.1.5 Representativeness

Representativeness is a qualitative parameter that is ensured through the careful development and review of the sampling and analysis strategy outlined in the OU-6 Workplan and SOPs for sample collection and analysis and field data collection.

3.1.6 DQOs for Environmental Evaluation Investigations

DQOs for the EE investigations described in the Environmental Evaluation Workplan for OU-6 (Section 9 of the OU-6 Workplan) will be developed during Stage I of the EE (summarized here in Section 3.4). Development of DQOs for the EE will follow steps recommended by EPA in EPA/600/3-89/013, Ecological Assessments of Hazardous Waste Sites: A Field and Laboratory Reference Document, and EPA/540/G-90/008, Guidance for Data Usability in Risk Assessment. The first step in developing DQOs for the EE is to identify appropriate site-specific receptor species, contaminants of concern, and exposure pathways. The DQO development process will then include identification of data uses and needs and design of the data collection program. The phased, three-stage sequential approach to conducting the EE, as described in the OU-6 EE Workplan, will allow the investigators to identify site-specific receptor species and potential exposure pathways necessary to develop the DQOs and then further define the EE based on the DQOs.

TABLE 1
Standard Operating Procedures and Field Activities for Which They are Applicable

Standard Operating Procedures	Field Screening	Subway	Well Drilling	Completion, Development	Ground-Water Sampling	Surface-Water Sampling	Sediment Sampling	Surface Soil Sampling	Subsurface Soil/Well Sampling	Source Sampling	Blank Sampling
1.1 Wind Blown Contaminant Dispersion Control		●	●	●	●	●		●	●		
1.2 Field Document Control	●	●	●	●	●	●	●	●	●	●	●
1.3 General Equipment Decontamination	●	●	●	●	●	●	●	●	●	●	●
1.4 Heavy Equipment Decontamination		●	●	●	●	●	●	●	●	●	●
1.5 Handling of Purge and Development Water		●	●		●						
1.6 Handling of Personal Protective Equipment	●	●	●	●	●	●	●	●	●	●	●
1.7 Handling of Decontamination Water & Wash Water	●	●	●	●	●	●	●	●	●	●	●
1.8 Handling of Drilling Fluids & Cuttings		●					●		●		
1.9 Handling of Residual Samples								●	●	●	●
1.10 Receiving, Labeling, and Handling Waste Containers		●	●						●	●	●
1.11 Field Communications	●	●	●	●	●	●	●	●	●	●	●
1.12 Decontamination Facility Operations	●	●	●	●	●	●	●	●	●	●	●
1.13 Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples				●	●	●	●	●	●	●	●
1.14 Field Data Management	●	●	●	●	●	●	●	●	●	●	●
1.15 Use of PIDs and FIDs		X	X	X	X	X	X	X	X	X	X
1.16 Field Radiological Measurements a) Walk-Over Surveys	●	X	X	X	X	X	X	X	X	X	X
b) Sample and Waste Screening		X	X	X	X	X	X	X	X	X	X
2.1 Water Level Measurements in Wells and Piezometers		●	●	●							
2.2 Well Development a) New Wells		●									
b) Redevelopment		●									
2.5 Measurements for Groundwater Field Parameters				●							
2.6 Groundwater Sampling a) Bailer					●						
b) Pump					●						

X - As required by H&S plan.

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TABLE 1 (Continued)
Standard Operating Procedures and Field Activities for Which They are Applicable

Standard Operating Procedures	Field Screening	Survey	Well Drilling	Groundwater Sampling	Surface-Water Sampling	Sediment Sampling	Surface Soil Sampling	Subsurface Soil Sampling	Source Sampling	Biota Samples
3.1 Logging Alluvial and Bedrock Material		●								
3.2 Drilling and Sampling Using Hollow-Stem Auger Techniques										
a) Drilling			●					●		
b) Continous Auger Coring			●					●		
c) Drive Samples			●					●		
3.5 Plugging and Abandonment of Boreholes			●					●		
3.6 Monitoring Well and Piezometer Installation			●							
3.8 Surface Soil Sampling							●			
3.9 Soil Gas Sampling and Field Analysis	●									
3.10 Borehole Clearing								●		
3.11 Plugging and Abandonment of Wells			●							
4.1 Surface Water Data Collection Activities					●					
4.2 Field Measurement of Surface Water Parameters					●					
4.3 Surface Water Sampling					●					
4.6 Sediment Sampling						●				
4.8 Pond Sampling					●					
5.1 Sampling of Periphyton										●
5.2 Sampling of Benthic Macroinvertebrates										●
5.3 Sampling of Plankton										●
5.4 Sampling of Fishes										●
5.5 Sampling of Large Mammals										●
5.6 Sampling of Small Mammals										●
5.7 Sampling of Birds										●
5.8 Sampling of Reptiles and Amphibians										●
5.9 Sampling of Terrestrial Arthropods										●
5.10 Sampling of Terrestrial Vegetation										●

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3.2 Sampling Locations and Sampling Procedures

The Phase I field investigation programs, including sampling procedures and sampling locations, for each IHSS within the OU-6 area are described in Section 7.2 and summarized in Tables 7-1 through 7-7 of the OU-6 Workplan.

3.2.1 Radiation Surveys

Radiation surveys will be performed over IHSSs 141, 143, and 165 (OU-6 Workplan, Figure 2-1) according to SOP 1.16, Field Radiological Measurements. Radiation readings will be taken on a 25-foot grid over IHSSs 141 and 165, and on a 10-foot grid over IHSS 143. This sampling is considered a field screening activity with analytical level I data quality requirements.

3.2.2 Soil Gas Surveys

A soil gas survey will be conducted over IHSS 165 (OU-6 Workplan, Figure 7-1). Soil gas samples will be taken on a 50-foot grid according to the procedures described in SOP 3.9, Soil Gas Sampling and Field Analysis. This sampling and data collection is also considered a field screening activity with analytical level I data quality requirements.

3.2.3 Geophysical Survey

Surface geophysical techniques will be utilized to estimate the location and lateral extent of Trenches A, B, and C at IHSS 166 (OU-6 Workplan, Figure 705). Electromagnetic (EM) methods will be employed, as described in Section 7.2.5 of the OU-6 Workplan. This sampling and data collection is also considered a field screening activity with analytical level I data quality requirements.

3.2.4 Surface Soil Sampling

Surface soil samples will be collected to a depth of 2 inches at IHSSs 141, 167, 216.1, and at areas identified by the radiation survey as having above-background radiation levels at 143. Surface soil samples will be collected according to SOP 3.8, Surface Soil Sampling. Samples will be collected on a 25-foot grid over IHSS 141 (OU-6 Workplan, Figure 7-1), on a 50-foot grid over IHSS 167 (OU-6 Workplan, Figure 7-5), and a 200-foot grid over IHSS 216.1 (OU-6 Workplan, Figure 7-3). Surface soil sampling and analysis is a contaminant characterization activity where the goal is to collect data of a known quality (i.e., analytical level IV data quality requirements).

3.2.5 Subsurface Soil Sampling and Collection of Soil Cores

Subsurface soil samples will be collected from soil borings in IHSSs 143, 165, and 166. Soil borings will be drilled according to SOP 3.2, Drilling and Sampling Using Hollow-Stem Auger Techniques. Subsurface samples will consist of soil cores collected according to continuous auger coring techniques described in SOP 3.2. Soil borings in IHSS 143 will be drilled on a 20-foot grid (OU-6 Workplan, Figure 7-5). At IHSS 165, soil cores will be collected on a random basis after every 25 soil gas samples to confirm the results of the soil gas survey. If plumes are identified by the soil gas survey, soil borings will be utilized to transect the plane, with soil samples taken continuously during drilling.

At IHSS 166, soil borings will be drilled on 25-foot centers along the long axis of each trench (OU-6 Workplan, Figure 7-5). The specifics of the soil sampling program are described in Section 7.2 of the OU-6 Workplan. The purpose of this sampling and subsequent analysis is to obtain contaminant characterization information, where data is of a known quality. Therefore, this activity requires analytical level IV data quality.

3.2.6 Surface Water and Sediment Sampling

Surface water and sediment samples will be collected from the four A-series Detention Ponds and the five B-series Detention Ponds at IHSS 142.12 (OU-6 Workplan, Figure 7-2 and 7-3). The water

sampling and sediment sampling design for the ponds are described in Section 7.2.2 of the OU-6 Workplan. In addition to the pond sampling, sediment samples will be collected along Walnut Creek (OU-6 Workplan, Figure 7-4). Water samples will be collected according to SOP 4.8, Pond Sampling, and the addendum to SOP 4.8 described in Section 11.2 of the OU-6 Workplan. Sediment samples will be collected according to SOP 4.6, Sediment Sampling, and the addendum to SOP 4.6 described in Section 11.1 of the OU-6 Workplan. Laboratory analytical data obtained from this sampling and analysis should be of a known quality (i.e., analytical levels IV and V data quality requirements). Surface water field data measurements are considered characterization screening data with analytical level I and II data quality requirements.

3.2.7 Groundwater Sampling

Monitoring wells will be installed downgradient from IHSSs 141, 142, 166, and 167 to monitor and sample alluvial groundwater flowing underneath the IHSSs. Monitoring wells will also be installed within IHSS 165 to monitor the saturated alluvium in the Triangle Area. The numbers of wells, proposed depths, sampling frequencies, and locations are discussed in Section 7.2 of the OU-6 Workplan. The wells will be drilled according to SOP 3.2, Drilling and Sampling Using Hollow-Stem Auger Techniques, and installed according to SOP 3.6, Monitoring Well and Piezometer Installation. The wells will be developed according to SOP 2.2, Well Development. Groundwater samples will be collected according to SOP 2.6, Groundwater Sampling. Analytical data from these samples will be of a known quality (analytical level IV data quality). Groundwater field measurements, with analytical level I and II data quality requirements, will be obtained according to SOP 2.5, Measurements of Groundwater Field Parameters. Water level measurements will be obtained according to SOP 2.1, Water Level Measurements in Wells and Piezometers, to provide geohydrologic characterization data. This data is considered analytical level I quality data.

3.3 Analytical Procedures

The analytical program for OU-6 Phase I RFI/RI activities is discussed in Section 7.3 of the OU-6 Workplan. The analytical methods that shall be adhered to are those that are specified in the

GRRASP. These methods are referenced in Section 3.3.3 of the QAPjP. Specific analytical methods for each analyte are also referenced here in Appendix A.

3.4 Environmental Evaluation: Summary of Surveying and Sampling

The Environmental Evaluation Workplan for OU-6 (Section 9 of the OU-6 Workplan) presents a three-stage sequential approach for conducting the EE for the Walnut Creek Drainage Area. Stage I of the EE will include an initial determination of the scope of the environmental evaluation, identification and development of DQOs, conducting a field inventory, and field sampling. The field inventory will provide qualitative and quantitative information necessary to characterize the biota and trophic relationships. Information obtained during the field inventory will also be utilized to finalize the field sampling plan and further define the DQOs. Stage II of the EE will consist of a contamination assessment (including toxicity and exposure assessment), development of the site-specific food web pathway model, and characterization of impact to biota. Stage III will consist of biological contamination studies, including field and laboratory analyses of contaminant levels. Additional toxicological investigations may be included. Remediation criteria and an EE Report will also be developed during Stage III.

A preliminary field sampling plan is described in Section 9.8 of the OU-6 EE Workplan. The field surveys conducted during Stage I of the EE will provide information needed to develop DQOs and to further develop this plan, including determining final sampling locations and establishing reference areas. Field sampling will be conducted during Stage I and Stage III (although field samples collected during Stage I will be used for toxicity tests and contamination studies of Stage III where possible). Field samples will be collected for the following environmental parameters:

- Terrestrial vegetation (including wetland vegetation along North and South Walnut Creek and the Unnamed Tributary),
- Terrestrial wildlife (including small and large mammals, reptiles, and birds),
- Terrestrial arthropods (invertebrates),
- Periphyton,

- Benthos, and
- Fish.

Preliminary sampling locations are described in the OU-6 Workplan.

The applicable SOPs for EE field sampling are listed in Table 1 as SOPs 5.1 through 5.10. Section 9.8.4 of the OU-6 EE Workplan contains additional detail on proposed surveying and sampling methods.

3.5 Equipment Decontamination

Non-dedicated sampling equipment shall be decontaminated between sampling locations in accordance with SOP 1.3, General Equipment Decontamination. Other equipment (e.g., heavy equipment) potentially contaminated during drilling, hydrogeologic/geologic testing, boring, sample collection, etc. shall also be decontaminated as specified in SOP 1.4, Heavy Equipment Decontamination.

3.6 Air Quality

Ambient air concentration modeling to estimate environmental risk which results from airborne transport of OU-6 contaminants to potential receptors is discussed in Section 9.3 of the OU-6 EE Workplan. Air quality dispersion modeling using a Chi/Q approach will be performed.

3.7 Quality Control Samples

To assure the quality of the field sampling techniques, collection and/or preparation of field quality control (QC) samples are incorporated into the sampling scheme. Field QC samples and collection frequencies for the field investigations are shown in Table 2. A specific sampling schedule will be prepared by the sampling subcontractor for approval by the EMAD laboratory analysis task leader (Figure 1) prior to sampling.

TABLE 2
FIELD QC SAMPLE COLLECTION FREQUENCY

Activity	Frequency
Field Duplicate	1 in 10[1]
Field Preservation Blanks[2]	1 sample per shipping container (or a minimum of 1 per 20 samples)
Trip Blank[3]	1 in 20[4]
Equipment Rinsate Blank	1 in 20[5]
Triplicate Samples (benthic samples)	For each sampling site.

1. Or per sampling event, whichever is more frequent.
2. For samples to be analyzed for inorganics.
3. For samples to be analyzed for volatile organics only.
4. A trip blank shall not be used for radiochemistry samples because radionuclide samples are less likely to be contaminated from direct exposure to air than are samples of volatile organics.
5. One equipment rinsate blank in twenty samples for each specific sample matrix being collected when non-dedicated equipment is being used.

In addition, a QC sample, which will consist of an extra volume of a designated field sample, shall be collected at a 5-percent frequency for each specific sample matrix. These QC samples shall be collected and submitted to the laboratory to allow for the analysis of laboratory prepared QC samples to provide the laboratory with a check on its internal operations. The volume required for the QC sample shall be double that of a normal sample.

3.7.1 Objectives for Field QC Samples:

Equipment rinsate blanks are considered acceptable (with no need for data qualification) if the concentration of analytes of interest is less than three times the required detection limit for each analyte as specified in Appendix A. Field duplicate samples shall agree within 30 percent relative percent difference for aqueous samples and 40 percent for homogenous, non-aqueous samples.

Trip blanks and field preservation blanks (for organics and inorganics, respectively) indicate possible field contamination when analytes are detected above the minimum detection limits presented in Appendix A. The Laboratory Analysis Task Leader (Figure 1) is responsible for verifying these criteria and shall be responsible for checking to see if they are met and for qualifying data.

3.7.2 Laboratory QC

Laboratory QC procedures are used to provide measures of internal consistency of analytical and storage procedures. The laboratory contractor will submit written SOPs to the laboratory analysis task leader for approval. The interlaboratory SOPs shall be consistent with or equivalent to EPA-CLP QC procedures. The laboratory SOPs must cover the following areas in sufficient detail and reflect actual operating conditions in effect during analysis of EG&G RFP samples:

- Sample receipt and log-in
- Sample storage and security
- Facility security
- Sample tracking (from receipt to sample disposition)
- Sample analysis method references

- Data reduction, verification, and reporting
- Document control (including submitting documents to EG&G)
- Data package assembly (see Section III.A of the GRRASP)
- Qualifications of personnel and resumes
- Preparation of standards
- Equipment maintenance and calibration
- List of instrumentation and equipment (including date purchased, date installed, model number, manufacturer, and service contracts, if any)
- Instrument detection limits
- Acceptance criteria for non-CLP analyses
- Laboratory QC checks applicable to each analytical method

Laboratory QC techniques to ensure consistency and validity of analytical results (including detecting potential laboratory contamination of samples) include using reagent blanks, field blanks, internal standard reference materials, laboratory replicate analysis, and field duplicates. The laboratory contractor will follow the standard evaluation guidelines and QC procedures, including frequency of QC checks, that are applicable to the particular type of analytical method being used as specified in the GRRASP and Section 3.3 of the QAPjP. All data packages will be forwarded to the Laboratory Analysis Task Leader or validation contractor (Figure 1) for review and verification.

3.8 Quality Assurance Monitoring

To assure the overall quality of each IAG deliverable required by this activity, surveillances will be conducted at various intervals. The intervals will be determined by the importance and complexity of each sub-task. Intervals will also be based on the schedule contained in Section 6.0 of the OU-6 Workplan. At a minimum, each of the field sampling activities described in the Field Sampling Plan (Section 7.0 of the OU-6 Workplan) will be monitored by an independent surveillance team at least once during the sampling process. EG&G will conduct audits of the laboratory contractor as specified in the GRRASP (a minimum of two audits during sample analysis for OU-6 samples).

3.9 Data Reduction, Validation, and Reporting

3.9.1 Analytical Reporting Turnaround Times

Analytical reporting turnaround times are as specified in Table 3-1 of the QAPjP.

3.9.2 Data Reduction

Reduction of laboratory measurements shall be in accordance with the methods specified for each analytical method. Laboratory data will be compiled into sample data packages by the laboratory contractor. A sample data package shall be developed for each sample delivery group or sample batch, with separate data packages for each type of analysis (e.g., a data package for organics, one for inorganics, one for water quality parameters, and one for radionuclides). The sample data package shall consist of a cover sheet/transmittal letter, a case narrative, data summary forms, and copies of the data checklists found in Exhibit II of the GRRASP. The reduced data will be used in the data validation process to verify that the laboratory control and the overall system DQOs have been met.

3.9.3 Data Validation

Validation activities consist of reviewing and verifying field and laboratory data and evaluating these verified data for data quality (i.e., comparison of reduced data to DQOs, where appropriate). The field and laboratory data validation activities and guidelines are described and referenced in Section 3.3.4.2 of the QAPjP. The process for validating the quality of the data is illustrated graphically in Figure 3-1 of the QAPjP, and is also included as part of the sample collection, chain-of-custody, and analysis process illustrated in Figure 8-1 of the QAPjP. The criteria for determining the validity of ER Program data at Rocky Flats are described in Section 3.3.7 of the QAPjP.

3.9.4 Data Reporting

Depending on the data validation process, data are flagged as either "valid," "acceptable with qualifications," or "rejected." The results of the data validation shall be reported in ER Department Data Assessment Summary reports. The usability of data (the criteria of which is also described in Section 3.3.7 of the QAPjP) shall also be addressed by the RI Project Manager.

4.0 PROCUREMENT DOCUMENT CONTROL

Contractors will perform the field investigations described in the OU-6 Workplan. Procurement document packages will require the Contractors to implement all requirements contained in the OU-6 Workplan, the QAPjP, this QAA, and all applicable SOPs referenced in these documents. Analytical services will also be contracted for analysis of field samples. Appropriate requirements from the QAPjP, this QAA, and the GRRASP shall be passed on to any organizations performing these analyses in the procurement document package. Contractors may also be utilized to validate analytical data packages. Applicable requirements from this QAA shall be transmitted to the validation Contractor.

The implementing Contractors will be required to provide the materials necessary for performing the work described in the OU-6 Workplan.

Contractors may be required to submit a QA Program that meets the applicable requirements of the QAPjP and this QAA.

5.0 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

The OU-6 Workplan describes the activities to be performed. The plan will be reviewed and approved in accordance with the requirements for instructions, procedures, and drawings outlined in the QAPjP.

SOPs approved for use are identified in Table 1, which also indicates their applicability. Environmental survey and sampling methods for environmental evaluations are discussed in the OU-5 Workplan. Any additional quality-affecting procedures proposed for use but not identified here will be developed and approved as required by the QAPjP prior to performing the affected activity.

Section 11.0 of the OU-6 Workplan includes SOP addenda for Phase I investigations at OU-6 for SOPs 4.6, Sediment Sampling, and 4.8, Pond Sampling.

6.0 DOCUMENT CONTROL

The following documents will be controlled in accordance with the QAPjP:

- Phase I RFI/RI Work Plan for Walnut Creek Priority Drainage (Operable Unit No. 6);
- Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA RI/FS and RCRA RFI/CMS Activities (QAPjP);
- Quality Assurance Addendum (QAA) to the Rocky Flats Site-Wide QAPjP for Operable Unit No. 6, Walnut Creek Priority Drainage Phase I RFI/RI Activities;
- SOPs (all SOPs specified in the QAPjP, this QAA, and to-be-developed laboratory SOPs).

7.0 CONTROL OF PURCHASED ITEMS AND SERVICES

Contractors that provide services to support the OU-6 Workplan activities will be selected and evaluated as outlined in the QAPjP. This includes preaward evaluation/audit of proposed Contractors as well as periodic audit of the acceptability of Contractor performance during the life of the contract. Any items or materials that are purchased for use during the OU-6 Phase I investigations that have the ability to affect the quality of the data shall be inspected upon receipt.

8.0 IDENTIFICATION AND CONTROL OF ITEMS, SAMPLES, AND DATA

8.1 Sample Containers/Preservation

Appropriate volumes, containers, preservation requirements, and holding times for samples are presented in Tables 8-1 through 8-4 of the QAPjP. Requirements for environmental evaluation samples are included in Table 3.

8.2 Sample Identification

RFI/RI samples shall be labeled and identified in accordance with Section 8.3.2.2 of the QAPjP and the SOPs in Table 1. Samples shall have unique identification that traces the sample to the source(s) and indicates the method(s), date, the sampler(s), and conditions prevailing at the time of sampling. Sample identification requirements for environmental evaluation samples are discussed in the EE Workplan (Section 9 of the OU-6 Workplan) and will be specified in the EE field sampling strategy.

8.3 Chain-of-Custody

Sample chain-of-custody will be maintained through the application of SOP 1.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples, and as illustrated in Figure 8-1 of the QAPjP for all environmental samples collected during field investigations.

TABLE 3

HOLDING TIMES, PRESERVATION METHODS, AND SAMPLE CONTAINERS FOR BIOTA SAMPLES

	Holding Time From Date Collected	Preservation Method	Container	Approximate Sample Size*
SAMPLES FOR METALS ANALYSES				
TERRESTRIAL VEGETATION				
- Metals Determined by ICP**	6 mos.	Freeze & ship w/dry ice	Paper bag inserted into plastic bag and sealed	25 g
- Metals Determined by GFAA***	6 mos.	Freeze & ship w/dry ice	Paper bag inserted into plastic bag and sealed	25 g
- Hexavalent Chromium	24 hours	Freeze & ship w/dry ice	Paper bag inserted into plastic bag and sealed	25 g
- Mercury	28 days	Freeze & ship w/dry ice	Paper bag inserted into plastic bag and sealed	5 g
Periphyton and Benthic Macroinvertebrates				
- Metals Determined by ICP	6 mos.	Freeze & ship w/dry ice	Plastic	25 g
- Metals Determined by GFAA	6 mos	Freeze & ship w/dry ice	Plastic	25 g
- Hexavalent Chromium	24 hours	Freeze & ship w/dry ice	Plastic	25 g
- Mercury	28 days	Freeze & ship w/dry ice	Plastic	5 g

TABLE 3

HOLDING TIMES, PRESERVATION METHODS, AND SAMPLE CONTAINERS FOR BIOTA SAMPLES

	Holding Time From Date Collected	Preservation Method	Container	Approximate Sample Size*
SAMPLES FOR RADIONUCLIDE ANALYSES				
Terrestrial Vegetation				
- Uranium 223, 234, 235, 238 Americium 241 Plutonium 239, 240	6 mos	Freeze & ship w/dry ice	Paper bag inserted into plastic bag and sealed	1 kg
Periphyton and Benthic Macroinvertebrates				
- Uranium 233, 234, 235, 238 Americium 241 Plutonium 239, 240	6 mos	Freeze & ship w/dry ice	Plastic	1 kg

* Sample size may vary with specific laboratory requirements.

**ICP = Inductively Coupled Argon Plasma Emission Spectroscopy. Metals to be determined include Ba, Cr, Cu, and Fe.

***GFAA = Graphite Furnace Atomic Absorption Spectroscopy. Metals to be determined include As, Cd, Li, Pg, Se, and Sr.

9.0 CONTROL OF PROCESSES

The overall process of collecting samples, performing analysis, and inputting the data into a database is considered a process that requires control. The process is controlled through a series of written procedures that govern and document the work activities. The process is illustrated diagrammatically in Section 8.3.2 of the QAPjP.

10.0 INSPECTION

Procured materials and construction activities (e.g., groundwater monitoring well installation) shall be inspected (as applicable) in accordance with the requirements specified in Section 10.0 of the QAPjP.

11.0 TEST CONTROL

Test control requirements specified in Section 11.0 of the QAPjP are not applicable to any of the Phase I RFI/RI investigations described in the OU-6 Workplan.

12.0 CONTROL OF MEASURING AND TEST EQUIPMENT (M&TE)

12.1 Field Equipment

Specific conductivity, temperature, pH, and dissolved oxygen content of water samples shall be measured in the field. Field measurements will be taken and the instruments calibrated as specified in SOP 4.2 (see Table 1). Measurements shall be made using the following equipment (or EG&G-approved alternates):

- Specific Conductivity: HACH Conductivity Meter
- Dissolved Oxygen: HACH Dissolved Oxygen Meter
- pH: HACH pH Meter (this meter will also be used for temperature measurements)

Each piece of field equipment shall have a file that contains:

- Operating instructions;
- Routine preventative maintenance procedures, including a list of critical spare parts to be provided or available in the field;
- Calibration methods, frequency, and description of the calibration solutions; and
- Standardization procedures (traceability to nationally recognized standards).

The above information shall, in general, conform to the manufacturer's recommended operating instructions or shall explain the deviation from said instructions.

12.2 Laboratory Equipment

Laboratory analyses will be performed by contracted laboratories. The equipment used to analyze environmental samples shall be calibrated, maintained, and controlled in accordance with the requirements contained in the specific analytical protocols used as specified in the GRRASP. This information will be supplied to EG&G as a laboratory SOP.

13.0 HANDLING, STORAGE, AND SHIPPING

Samples shall be packaged, transported, and stored in accordance with SOP 1.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples. Maximum sample holding times, sample preservative, sample volumes, and sample containers are specified in Table 8-1 of the QAPjP. Sample handling and storage controls at the laboratory shall be provided as a laboratory SOP.

EMAD will develop and implement an SOP for handling and storing construction materials to ensure only appropriate, accepted materials are used and are handled and stored to prevent contamination or damage prior to use/installation.

14.0 STATUS OF INSPECTION, TEST, AND OPERATIONS

The requirements for the identification of inspection, test, and operating status shall be implemented as specified in Section 14.0 of the QAPjP. A log specifying the status of all boreholes and groundwater monitoring wells shall be maintained by the Field Activities Task Leader, which will include: well/borehole identification number, ground elevation, casing depth of hole, depth to bedrock, static water level (as applicable), depth to top and bottom of screen (as applicable), diameter of hole, diameter of casing, and top/bottom of casing.

15.0 CONTROL OF NONCONFORMANCES

The requirements for the identification, control, evaluation, and disposition of nonconforming items, samples, and data will be implemented as specified in Section 15.0 of the QAPjP. Nonconformances identified by the implementing contractor shall be submitted to EG&G for processing as outlined in the QAPjP.

16.0 CORRECTIVE ACTION

The requirements for the identification, documentation, and verification of corrective actions for conditions adverse to quality will be implemented as outlined in Section 16.0 of the QAPjP. Conditions adverse to quality identified by the implementing contractor shall be documented and submitted to EG&G for processing as outlined in the QAPjP.

17.0 QUALITY ASSURANCE RECORDS

QA records will be controlled in accordance with the SOP 1.2, Field Document Control. QA records to be generated during OU-6 Phase I activities include, but are not limited to:

- Field Logs and Data Record Forms (e.g., sample collection notebooks/logs for water, sediment, and air)
- Calibration Records

- Sample Collection and Chain-of-Custody Records
- Laboratory Sample Data Packages
- Drilling Logs
- Work Plan/Field Sampling Plan
- QAPjP/QAA
- Audit/Surveillance/Inspection Reports
- Nonconformance Reports
- Corrective Action Documentation
- Data Validation Results
- Data Reports
- Procurement/Contracting Documentation
- Training/Qualification Records
- Inspection Records

18.0 QUALITY VERIFICATION

The requirements for the verification of quality shall be implemented as specified in Section 18.0 of the QAPjP. Audits of Contractors providing field investigation, construction, and analytical support services shall be performed at least annually or once during the life of the project, whichever is more frequent.

19.0 SOFTWARE CONTROL

The requirements for the control of software shall be implemented as specified in Section 19.0 of the QAPjP. Only database software is anticipated to be used for the OU-6 Workplan activities. SOPs applicable to the use of the database storing environmental data are SOP 1.14, Field Data Management.

APPENDIX A

Analytical Methods, Detection Limits, and Data Quality Objectives

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Required Detection Limits Water	Required Detection Limits Soil/Sed.	Precision Objective	Accuracy Objective
INDICATORS									
Total Suspended Solids	EPA 160.2[d]	X[u]				10 mg/L	NA	20%RPD[r]	80-120% LCS Recovery
Total Dissolved Solids	EPA 160.1[d]	X[r]	X[r]			5 mg/L	NA	20%RPD[r]	80-120% LCS Recovery
pH	EPA 150.1[d]	X[u]	X[r]			0.1 pH units	0.1 pH units	NA	±0.05 pH units
INORGANICS									
Target Analyte List - Metals		X[r]	X[r]	X	X			WATER/SOIL	WATER/SOIL
Aluminum	EPA CLP SOW[e]					200 ug/L[s]	40 mg/Kg[s]	**	***
Antimony	EPA CLP SOW[e]					60	12		
Arsenic (GFAA)	EPA CLP SOW[e]					10	2		
Barium	EPA CLP SOW[e]					200	40		
Beryllium	EPA CLP SOW[e]					5	1.0		
Cadmium	EPA CLP SOW[e]					5	1.0		
Calcium	EPA CLP SOW[e]					5000	2000		
Chromium	EPA CLP SOW[e]					10	2.0		
Cobalt	EPA CLP SOW[e]					50	10		
Copper	EPA CLP SOW[e]					25	5.0		
Cyanide	EPA 335.3 (modified for CLP)[e,d]					5	10		
Iron	EPA CLP SOW[e]					100 ug/L[s]	20 mg/Kg[s]	**	***
Lead (GFAA)	EPA CLP SOW[e]					3	1.0		
Magnesium	EPA CLP SOW[e]					5000	2000		
Manganese	EPA CLP SOW[e]					15	3.0		
Mercury (CVAA)	EPA CLP SOW[e]					0.2	0.2		
Nickel	EPA CLP SOW[e]					40	8.0		
Potassium	EPA CLP SOW[e]					5000	2000		
Selenium (GFAA)	EPA CLP SOW[e]					5	1.0		
Silver	EPA CLP SOW[e]					10	2.0		
Sodium	EPA CLP SOW[e]					5000	2000		
Thallium (GFAA)	EPA CLP SOW[e]					10	2.0		
Vanadium	EPA CLP SOW[e]					50	10		
Zinc	EPA CLP SOW[e]					20	4.0		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Required Detection Limits Water	Required Detection Limits Soil/Sed.	Precision Objective	Accuracy Objective
Other Metals		X[u]	X[r]	X	X			WATER/SOIL	WATER/SOIL
Molybdenum	EPA CLP SOW[b] (ICAP)					8 ug/L[t]	40 mg/Kg[t]	**	***
Cesium	EPA CLP SOW[b]					1000	200		
Strontium	EPA CLP SOW[b]					200	40		
Lithium	EPA CLP SOW[b]					100	20		
Tin	EPA CLP SOW[b]					200	40		
Other Inorganics									
Percent Solids	EPA 160.3[d]			X	X	NA	10 mg	NA	NA
Sulfide	EPA 376.1[d]			X	X	NA	4 ug/g	Same as metals	Same as metals
TOTAL ORGANIC CARBON	EPA 9060[e]	X[u]	X[u]	X	X	1 mg/L	1 mg/L	**	***
ANIONS								WATER/SOIL	WATER/SOIL
Carbonate	EPA 310.1[d]	X[u]	X[u]			10 mg/L	NA	Same as metals	Same as metals
Bicarbonate	EPA 310.1[d]	X[u]	X[u]			10 mg/L	NA		
Chloride	EPA 325.2[d]	X[u]	X[u]			5 mg/L	NA		
Sulfate	EPA 375.4[d]	X[u]	X[u]			5 mg/L	NA		
Nitrate as N	EPA 353.2[d] or 353.3[d]	X[u]	X[u]			1 mg/L	NA		
Fluoride	EPA 340.2[d]	X[u]	X[u]			5 mg/L	NA		
Oil and Grease	EPA 413.2[d]	X[u]				5 mg/L	NA	**	***
Target Compound List - Volatiles	EPA CLP SOW[c]	X[u]	X[u]	X	X			WATER/SOIL	WATER/SOIL
Chloromethane	EPA CLP SOW[c]					10 ug/L	10 ug/Kg (low)[j]	**	***
Bromomethane	EPA CLP SOW[c]					10	10		
Vinyl Chloride	EPA CLP SOW[c]					10	10		
Chloroethane	EPA CLP SOW[c]					10	10		
Methylene Chloride	EPA CLP SOW[c]					5	5		
Acetone	EPA CLP SOW[c]					10	10		
Carbon Disulfide	EPA CLP SOW[c]					5	5		
1,1-Dichloroethene	EPA CLP SOW[c]					5	5		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Required Detection Limits Water	Required Detection Limits Soil/Sed.	Precision Objective	Accuracy Objective
Target Compound List - Volatiles (continued)		X[v]	X[v]	X	X			WATER/SOIL	WATER/SOIL
1,1-Dichororethane	EPA CLP SOW[c]					5 ug/L	5 ug/Kg(low)[3]	**	***
total 1,2-Dichloroethene	EPA CLP SOW[c]					5	5		
Chloroform	EPA CLP SOW[c]					5	5		
1,2-Dichloroethane	EPA CLP SOW[c]					1	5		
2-Butanone	EPA CLP SOW[c]					10	10		
1,1,1-Trichoroethane	EPA CLP SOW[c]					5	5		
Carbon Tetrachloride	EPA CLP SOW[c]					5	5		
Vinyl Acetate	EPA CLP SOW[c]					10	10		
Bromodichloromethane	EPA CLP SOW[c]					5	5		
1,2-Dichloropropane	EPA CLP SOW[c]					5	5		
cis-1,3-Dichloropropene	EPA CLP SOW[c]					5	5		
Trichloroethene	EPA CLP SOW[c]					5	5		
Dibromochloromethane	EPA CLP SOW[c]					5	5		
1,1,2-Trichloroethane	EPA CLP SOW[c]					5	5		
Benzene	EPA CLP SOW[c]					5	5		
trans-1,2-Dichloropropene	EPA CLP SOW[c]					5	5		
Bromoform	EPA CLP SOW[c]					5	5		
4-Methyl-2-pentanone	EPA CLP SOW[c]					10	10		
2-Hexanone	EPA CLP SOW[c]					10	10		
Tetrachloroethene	EPA CLP SOW[c]					5	5		
Toluene	EPA CLP SOW[c]					5	5		
1,1,2,2-Tetrachoroethane	EPA CLP SOW[c]					5	5		
Chlorobenzene	EPA CLP SOW[c]					5	5		
Ethyl Benzene	EPA CLP SOW[c]					5	5		
Styrene	EPA CLP SOW[c]					5	5		
Total Xylenes	EPA CLP SOW[c]					5	5		
Target Compound List - Semi-Volatiles			X[v]	X	X			WATER/SOIL	WATER/SOIL
Phenol	EPA CLP SOW[c]					10 ug/L	330 ug/Kg[3]	**	***
bis(2-Chloroethyl)ether	EPA CLP SOW[c]					10	330		
2-Chlorophenol	EPA CLP SOW[c]					10	330		
1,3-Dichlorobenzene	EPA CLP SOW[c]					10	330		
1,4-Dichlorobenzene	EPA CLP SOW[c]					10	330		
Benzyl Alcohol	EPA CLP SOW[c]					10	330		
1,2-Dichlorobenzene	EPA CLP SOW[c]					10	330		
2-Methylphenol	EPA CLP SOW[c]					10	330		
bis(2-Chloroisopropyl)ether	EPA CLP SOW[c]					10	330		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Required Detection Limits Water	Required Detection Limits Soil/Sed.	Precision Objective	Accuracy Objective
Target Compound List - Semi-Volatiles (continued)			X[v]	X	X			WATER/SOIL	WATER/SOIL
4-Methylphenol	EPA CLP SOW[c]					10	330		
N-Nitroso-Dipropylamine	EPA CLP SOW[c]					10	330		
Hexachloroethane	EPA CLP SOW[c]					10	330		
Nitrobenzene	EPA CLP SOW[c]					10	330		
Isophorone	EPA CLP SOW[c]					10	330		
2-Nitrophenol	EPA CLP SOW[c]					10	330		
2,4-Dimethylphenol	EPA CLP SOW[c]					10	330		
Benzoic Acid	EPA CLP SOW[c]					50	1600		
bis(2-Choroethoxy)methane	EPA CLP SOW[c]					10	330		
2,4-Dichlorophenol	EPA CLP SOW[c]					10	330		
1,2,4-Trichlorobenzene	EPA CLP SOW[c]					10	330		
Naphthalene	EPA CLP SOW[c]					10	330		
4-Chloroanaline	EPA CLP SOW[c]					10	330		
Hexachlorobutadiene	EPA CLP SOW[c]					10	330		
4-Chloro-3-methylphenol	EPA CLP SOW[c]					10	330		
2-Methylnaphthalene	EPA CLP SOW[c]					10	330		
Hexachlorocyclopentadiene	EPA CLP SOW[c]					10 ug/L	330 ug/Kg[3]	**	***
2,4,6-Trichlorophenol	EPA CLP SOW[c]					10	330		
2,4,5-Trichlorophenol	EPA CLP SOW[c]					50	1600		
2-Chloronaphthalene	EPA CLP SOW[c]					10	330		
2-Nitroanaline	EPA CLP SOW[c]					50	1600		
Dimethylphthalate	EPA CLP SOW[c]					10	330		
Acenaphthylene	EPA CLP SOW[c]					10	330		
2,6-Dinitrotoluene	EPA CLP SOW[c]					10	330		
3-Nitroaniline	EPA CLP SOW[c]					50	1600		
Acenaphthene	EPA CLP SOW[c]					10	330		
2,4-Dinitrophenol	EPA CLP SOW[c]					50	1600		
4-Nitrophenol	EPA CLP SOW[c]					50	1600		
Dibenzofuran	EPA CLP SOW[c]					10	330		
2,4-Dinitrotoluene	EPA CLP SOW[c]					10	330		
Diethylphthalate	EPA CLP SOW[c]					10	330		
4-Chlorophenol Phenyl ether	EPA CLP SOW[c]					10	330		
Fluorene	EPA CLP SOW[c]					10	330		
4-Nitroanaline	EPA CLP SOW[c]					50	1600		
4,6-Dinitro-2-methylphenol	EPA CLP SOW[c]					50	1600		
N-nitrosodiphenylamine	EPA CLP SOW[c]					10	330		
4-Bromophenyl Phenyl ether	EPA CLP SOW[c]					10	330		
Hexachlorobenzene	EPA CLP SOW[c]					10	330		
Pentachlorophenol	EPA CLP SOW[c]					50	1600		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Required Detection Limits Water	Required Detection Limits Soil/Sed.	Precision Objective	Accuracy Objective
Target Compound List - Semi-Volatiles (continued)			X[a]	X	X			WATER/SOIL	WATER/SOIL
Phenanthrene	EPA CLP SOW[c]					10	330		
Anthracene	EPA CLP SOW[c]					10 ug/L	330 ug/Kg[d]	**	***
Di-n-butylphthalate	EPA CLP SOW[c]					10	330		
Fluoranthene	EPA CLP SOW[c]					10	330		
Pyrene	EPA CLP SOW[c]					10	330		
Butyl Benzylphthalate	EPA CLP SOW[c]					10	330		
3,3'-Dichlorobenzidine	EPA CLP SOW[c]					20	660		
Benzo(a)anthracene	EPA CLP SOW[c]					10	330		
Chrysene	EPA CLP SOW[c]					10	330		
bis(2-ethylhexyl)phthalate	EPA CLP SOW[c]					10	330		
Di-n-octyl Phthalate	EPA CLP SOW[c]					10	330		
Benzo(b)fluoranthene	EPA CLP SOW[c]					10	330		
Benzo(k)fluoranthene	EPA CLP SOW[c]					10	330		
Benzo(a)pyrene	EPA CLP SOW[c]					10	330		
Indeno(1,2,3-cd)pyrene	EPA CLP SOW[c]					10	330		
Dibenz(a,h)anthracene	EPA CLP SOW[c]					10	330		
Benzo(g,h,i)perylene	EPA CLP SOW[c]					10	330		
Target Compound List - Pesticides/PCBs			X[a]	X	X			WATER/SOIL (%RPD)	WATER/SOIL (% Recovery)
alpha-BHC	EPA CLP SOW[c]					0.05 ug/L	8.0 ug/Kg[d]	**	***
beta-BHC	EPA CLP SOW[c]					0.05	8.0		
delta-BHC	EPA CLP SOW[c]					0.05	8.0		
gamma-BHC (Lindane)	EPA CLP SOW[c]					0.05	8.0		
Heptachlor	EPA CLP SOW[c]					0.05	8.0		
Aldrin	EPA CLP SOW[c]					0.05 ug/L	8.0 ug/Kg[d]	**	***
Heptachlor Epoxide	EPA CLP SOW[c]					0.05	8.0		
Endosulfan I	EPA CLP SOW[c]					0.05	8.0		
Dieldrin	EPA CLP SOW[c]					0.10	16.0		
4,4'-DDE	EPA CLP SOW[c]					0.10	16.0		
Endrin	EPA CLP SOW[c]					0.10	16.0		
Endosulfan II	EPA CLP SOW[c]					0.10	16.0		
4,4'-DDD	EPA CLP SOW[c]					0.10	16.0		
Endosulfan Sulfate	EPA CLP SOW[c]					0.10	16.0		
4,4'-DDT	EPA CLP SOW[c]					0.10	16.0		
Methoxychlor	EPA CLP SOW[c]					0.5	80.0		
Endrin Ketone	EPA CLP SOW[c]					0.10	16.0		
alpha-Chlordane	EPA CLP SOW[c]					0.5	80.0		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Required Detection Limits Water	Required Detection Limits Soil/Sed.	Precision Objective	Accuracy Objective
Target Compound List - Pesticides/PCBs (continued)			X[u]	X	X			WATER/SOIL (%RPD)	WATER/SOIL (% Recovery)
gamma-Chlordane	EPA CLP SOW[c]					0.5	80.0		
Toxaphene	EPA CLP SOW[c]					1.0	160.0		
AROCLOR-1016	EPA CLP SOW[c]					0.5	80.0		
AROCLOR-1221	EPA CLP SOW[c]					0.5	80.0		
AROCLOR-1232	EPA CLP SOW[c]					0.5	80.0		
AROCLOR-1242	EPA CLP SOW[c]					0.5	80.0		
AROCLOR-1248	EPA CLP SOW[c]					0.5	80.0		
AROCLOR-1254	EPA CLP SOW[c]					1.0	160.0		
AROCLOR-1260	EPA CLP SOW[c]					1.0	160.0	(Replicate Analyses)	(Laboratory Control Sample)
RADIONUCLIDES									
Gross Alpha	f,g,h,i,k,l,m,n,s	X[f,u]	X[f]	X	X	2 pCi/L	4 pCi/g	**	***
Gross Beta	f,g,h,i,k,l,m,n,s	X[f,u]	X[f]	X	X	4 pCi/L	10 pCi/g		
Uranium 233+234	f,h,i,m,n,l,s	X[f,u]	X[f]	X	X	0.6 pCi/L	0.3 pCi/g		
Uranium 235,238	f,h,i,m,n,l,s	X[f,u]	X[f]	X	X	0.6 pCi/L	0.3 pCi/g		
Americium 241	i,l,p,q,s	X[f,u]	X[f]	X	X	0.01 pCi/L	0.02 pCi/g		
Plutonium 239+240	i,l,o,p,s	X[f,u]	X[f]	X	X	0.01 pCi/L	0.03 pCi/g		
Tritium	f,g,h,m,i,l,s	X[u]	X[u]	X	X	400 pCi/L	400 pCi/L		
Strontium 89,90	f,h,i,m,s,l			X	X	NA	1 pCi/g		
Strontium 90 only	f,h,i,m	X[f,u]	X[f]			1 pCi/L	NA		
Cesium 137	n,i,l,m	X[f,u]	X[f]	X	X	1 pCi/L	0.1 pCi/g		
Radium 226	f,g,h,m[s],i,s,l	X[f,u]	X[f]			0.5 pCi/L	0.5 pCi/g		
Radium 228	f,g,h,m[s],i,s,l	X[f,u]	X[f]			1 pCi/L	0.5 pCi/g		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	SW	GW	SOIL	SED	Readability Objective	Accuracy
FIELD PARAMETERS							
pH	1	X	X			± 0.1 pH unit	± 0.2 pH units
Specific Conductance	1	X	X			2.5 umho/cm[7] 25 umho/cm[8] 250 umho/cm[9]	± 2.5% max. error at 500, 5000, 50000 umhos/cm plus probe; ± 3.0% max error at 250, 2500, and 25000 plus probe accuracy of ± 2.0%.
Temperature	1	X	X			± 0.1°C	± 1.0°C
Dissolved Oxygen	1	X				± 0.1 mg/L	± 10%
Barometric Pressure	1						

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

* For samples collected from IHSSs 102 and 105 only [BH01,BH02,BH03,BH04,BH05,BH06,BH07,BH08 (MW33),BH09,BH15,BH16,BH17,BH18,MW01,MW02,MW03,MW33 (BH08)].
** Precision objective = control limits specified in referenced method and/or Data Validation Guidelines.
*** Accuracy objective = control limits specified in referenced method (in GRRASP for radionuclides).
F = Filtered
U = Unfiltered

1. Measured in the field in accordance with instrument manufacturer's instructions. The instruments to be used are specified in Section 12.
2. Medium soil/sediment required detection limits for pesticide/PCB TCL compounds are 15 times the individual low soil/sediment required detection limit.
3. Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.
4. Higher detection limits may only be used in the following circumstance: If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the required detection limit. This is illustrated in the example below:

   For lead:

   Method in use - ICP
   Instrument Detection Limit (IDL) - 40
   Sample Concentration - 220
   Required Detection Limit (RDL) - 3

   The value of 220 may be reported even though the instrument detection limit is greater than the RDL.

   Note: The specified detection limits are based on a pure water matrix. The detection limits for samples may be considerably higher depending on the sample matrix.
5. If gross alpha > 5 pCi/L, analyze for Radium 226; if Radium 226 > 3 pCi/L, analyze for Radium 228.
6. The detection limits presented were calculated using the formula in N.R.C. Regulatory Guide 4.14, Appendix Lower Limit of Detection, pg. 21, and follow:

$$LLD = \frac{4.66\ (BKG/BKG\ DUR)^{1/2}}{(2.22)(Eff)(CR)(SR)(e^{-\lambda t})(Aliq)}$$

$$MDA = \frac{4.66\ (BKG/Sample\ DUR)^{1/2}}{(2.22)(Eff)(CR)(SR)e^{-\lambda t}(Aliq)}$$

Where:

LLD = Lower Limit of Detection in pCi per sample unit.
BKG = Instrument Background in counts per minute (CPM).
Eff = Counting efficiency in cpm/disintegration per minute (dpm).
CR = Fractional radiochemical yield.
SR = Fractional radiochemical yield of a known solution.
λ = The radioactive decay constant for the particular radionuclide.
t = The elapsed time between sample collection and counting.
Aliq = Sample volume.
BKG DUR = Background count duration in minutes.

MDA = Minimum Detectable Activity in pCi per sample unit
BKG = same as for LLD
Eff = same as for LLD
CR = same as for LLD
SR = same as for LLD
λ = same as for LLD
t = same as for LLD
Aliq = same as for LLD
Sample DUR = sample count duration in minutes

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

7. On 500 umho/cm range.
8. On 5000 umho/cm range.
9. On 50000 umho/cm range.

a. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version).
b. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version). The specific method to be utilized is at the laboratory's discretion provided it meets the specified detection limit.
c. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, 2/88 (or latest version).
d. Methods are from "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, 1983, unless otherwise indicated.
e. Methods are from "Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods," (SW-846, 3rd Ed.), U.S. Environmental Protection Agency.
f. U.S. Environmental Protection Agency, 1979, Radiochemical Analytical Procedures for Analysis of Environmental Samples, Report No. EMSL-LY-0539-1, Las Vegas, NV, U.S. Environmental Protection Agency.
g. American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1985. Standard Methods for the Examination of Water and Wastewater, 16th ed., Washington, D.C., Am. Public Health Association.
h. U.S. Environmental Protection Agency, 1976. Interim Radiochemical Methodology for Drinking Water, Report No. EPA-600/4-75-008. Cincinnati U.S. Environmental Protection Agency.
i. Harley, J.H., ed., 1975, HASL Procedures Manual, HASL-300; Washington, D.C., U.S. Energy Research and Development Administration.
j. EPA, 1982. "Methods for Organic Analysis of Municipal and Industrial Waste Water," US EPA-600/4-82-057.
k. "Handbook of Analytical Procedures," USAEC, Grand Junction Lab. 1970, page 196.
l. "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, August 1980, Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.
m. "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," U.S.G.S. Book 5, Chapter A5, 1977.
n. "Acid Dissolution Method for the Analysis of Plutonium in Soil," EPA-600/7-79-081, March 1979, U.S. EPA Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 1979.
o. "Procedures for the Isolation of Alpha Spectrometrically Pure Plutonium, Uranium, and Americium," by E.H. Essington and B.J. Drennon, Los Alamos National Laboratory, a private communication.
p. "Isolation of Americium from Urine Samples," Rocky Flats Plant, Health, Safety, and Environmental Laboratories.
q. "Radioactivity in Drinking Water," EPA 570/9-81-002.
r. If the sample or duplicate result is <5 x IDL, then the control limit is ± IDL.
s. U.S. EPA, 1987. "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual," EPA-520/5-84-006.